Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – NOV. / DEC. 2017

SUBJECT: LINEAR NETWORKS IN STEADY STATE ANALYSIS (EE 121)

(BRANCH: CE, E&C, E&E and BM)

Thursday, 23 November 2017

Time: 3 Hours **Max. Marks: 100**

✓ **Answer ANY FIVE FULL Questions.**

1. A) In the circuit of Fig. Q1A, find the current through 3Ω resistor using mesh current analysis.

   B) Convert the circuit shown in Fig. Q1B into a single voltage source across the terminals A and B using source transformation technique.

   (10+10)

2. A) Using network reduction techniques, find the resistance between A and B in the circuit shown in Fig. Q2A.

   B) In the circuit shown in Fig. Q2B, find the current through 5Ω resistor by node voltage analysis.

   (10+10)

3. A) An emf of e = 400 sin 418t volts when applied to a circuit results in a current of i = 20 sin (418t – 60^o) amps. Determine (i) frequency in Hz (ii) power factor (iii) circuit elements (iv) power consumed

   B) A 20Ω resistor in series with a choke coil is connected across a 200V, 50Hz, single phase AC Supply. The voltage across the resistor is 100V and that across the coil is 150V. Determine (i) parameters of the coil (ii) power consumed in the circuit (iii) power consumed in the coil.

   C) Starting from fundamentals, show that the current leads the voltage by 90^o in a pure capacitor. Deduce the value of average power consumed by the inductor.

   (5+10+5)

4. A) For the circuit shown in Fig. Q4A, find the current drawn from the supply and power consumed.

   B) In the network of Fig. Q4B, find the current through 10Ω resistor using node voltage analysis.

   (10+10)

5. A) In the circuit of Fig. Q5A, find the power dissipated in the (6+j3)Ω impedance using Thevenin's theorem.

   B) In the network of Fig. Q5B, determine the value of a pure resistance to be connected across A and B so that maximum power is transferred to it. Also, find the value of maximum power transferred.

(10+10)

6. A) In the circuit of Fig. Q6A, find the current in 6Ω resistor. Hence, verify Reciprocity theorem.

   B) With neat circuit diagram and phasor diagram, deduce the relation between line and phase values of voltage and currents in a balanced, 3 phase, delta connected load.

(10+10)

7. A) A two branch parallel circuit consists of a 5Ω resistor in series with a capacitor of 20μF in one branch and a 2Ω resistor in series with a variable inductance in the other branch. If the supply voltage is 100V with the angular frequency of 5000 rad/sec and the inductor is variable from zero to infinity, draw the locus of total current. Hence, determine the values of (i) minimum current (ii) maximum current (iii) value of inductance when the current is minimum.

   B) For the locus diagram shown in Fig. Q7B, draw the circuit configuration and insert all the element values. Supply voltage is 100V at 50Hz. Also, find the values of current at unity power factor.

(10+10)

8. A) A star connected, 3 phase, balanced load consists of a resistance of 8Ω in series with an inductive reactance 6Ω in each phase. The circuit is fed from a 400V, 3 phase, balanced, RYB supply. Determine (i) line currents (ii) active, reactive and apparent power (iii) readings of the two wattmeters connected to measure the power.

   B) Two wattmeter method is used to measure the power in a 3 phase, delta connected, balanced capacitive load connected to a 440V, 3 phase, balanced supply. One of the wattmeter reads 14.2 KW while the pointer of the other wattmeter kicks back. It reads 6.1 KW after reversing the terminals of the potential coil. Determine (i) power factor (ii) line current (iii) values of the elements of the load per phase.

(10+10)

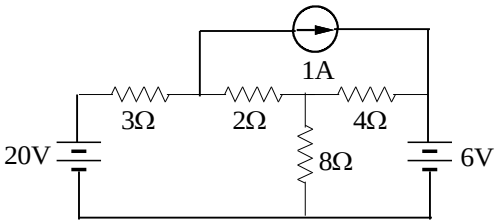

Fig. Q1A

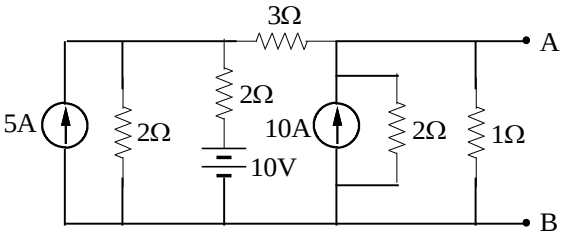

Fig. Q1B

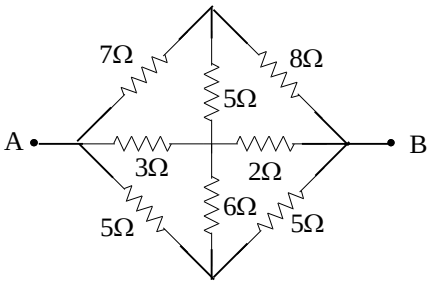

Fig. Q2A

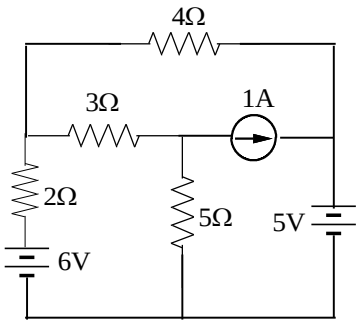

Fig Q2B

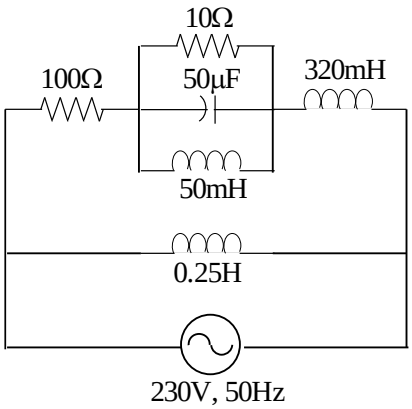

Fig. Q4A

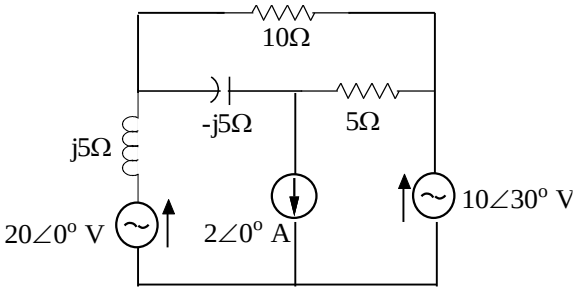

Fig. Q4B

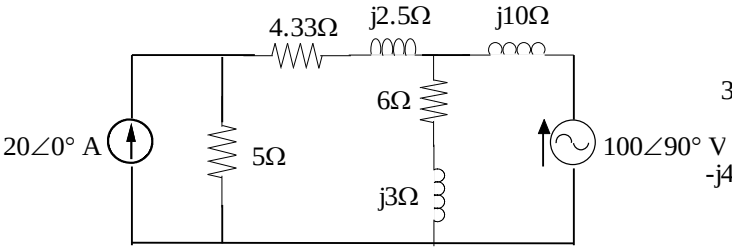

Fig. Q5A

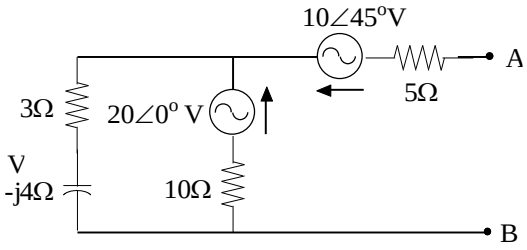

Fig. Q5B

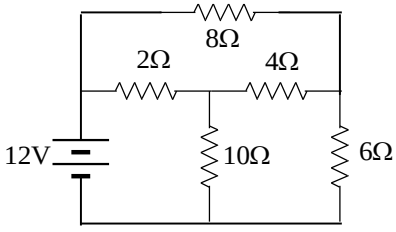

Fig. Q6A

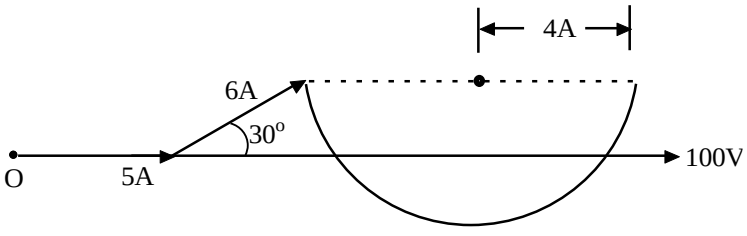

Fig. Q7B